

National Enteric Disease Surveillance:

Shiga toxin-producing *Escherichia coli* (STEC) Annual Report, 2010

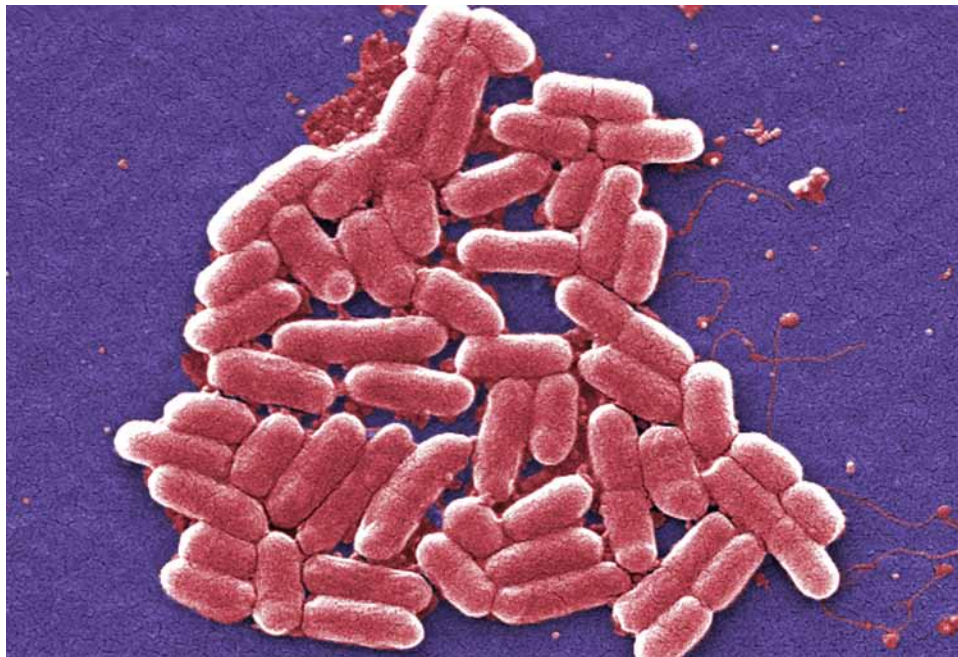
An overview of surveillance methods and systems for Shiga toxin-producing *Escherichia coli* (STEC) infections is available at <http://www.cdc.gov/ncezid/dfwed/PDFs/national-stec-surveillance-overview-508c.pdf> (1).

Human Surveillance Data: Laboratory-based Enteric Disease Surveillance (LEDS)

The Laboratory-based Enteric Disease Surveillance (LEDS) system collects reports of isolates from laboratory-confirmed human STEC infections from state public health laboratories. Reporting to LEDS is voluntary, and the number of states submitting reports varies somewhat from year to year, although almost all states report every year. Occasionally, more than one isolate is reported from a single episode of infection in a person; this report includes only one isolate of a given STEC serotype per person within a 30-day period.

In this report, we summarize the number of infections reported, and also report incidence rates (cases per 100,000 population), which are calculated as the number of STEC infections in humans reported for a given year divided by the reporting state population for that year. For figures and maps, STEC infections reported as “undetermined” are categorized as non-O157 STEC infections.

Data in this report current as of 1/22/2013.



Colorized scanning electron micrograph (SEM) of Gram-negative *Escherichia coli* O157:H7.

Table 1. Laboratory-confirmed STEC infections reported to CDC, with the 20 most frequently reported serogroups listed individually, United States, 2010

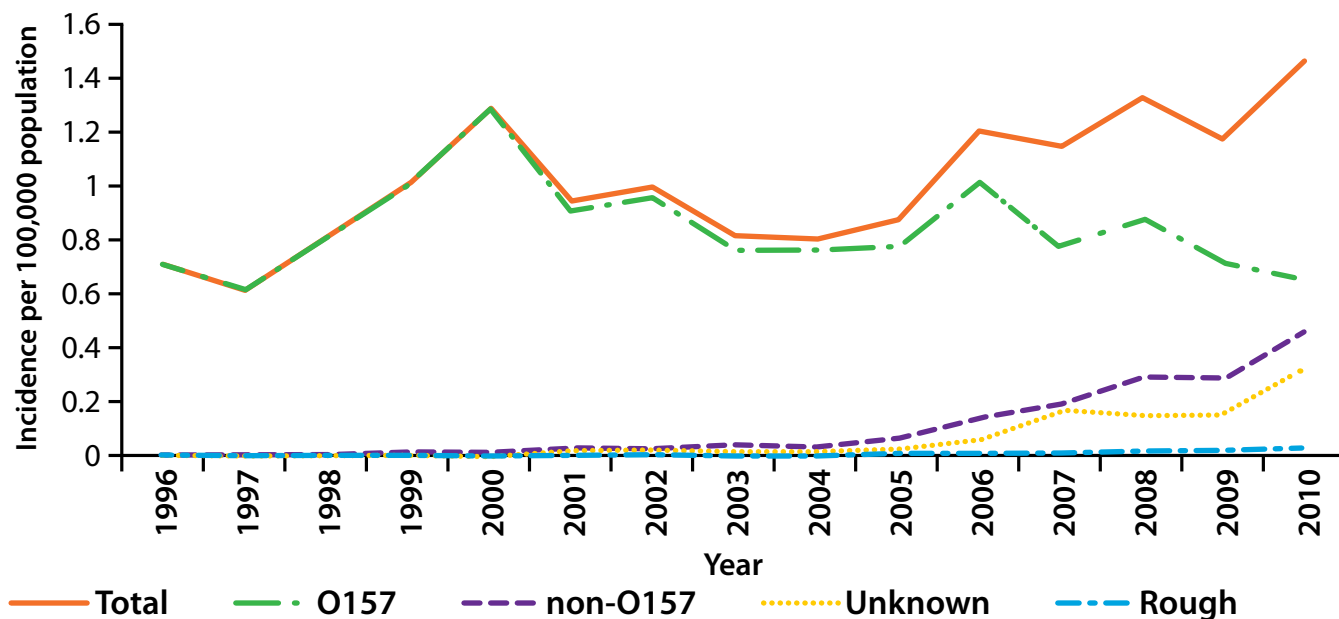
Rank	Serogroup	Number Reported	Percent
1	O157	2046	45.1
2	O26	434	9.6
3	O103	358	7.9
4	O111	236	5.2
5	O121	74	1.6
6	O145	74	1.6
7	O45	70	1.5
8	O118	22	0.5
9	O91	13	0.3
10	O69	12	0.3
11	O76	9	0.2
12	O146	6	0.1
13	O165	6	0.1
14	O130	4	0.1
15	O153	4	0.1
16	O181	4	0.1
17	O49	4	0.1
18	O110	3	0.1
19	O123	3	0.1
20	O126	3	0.1
	Sub Total	3385	74.6
	All other non-O157 STEC	65	1.4
	Unknown*	1000	22.1
	Rough	81	1.8
	Undetermined	4	0.1
	Sub Total	1150	25.4
		4535	100

*Infections of an unknown serogroup may represent Shiga toxin-positive stool specimens from which no STEC was isolated that were reported as STEC; although they would not meet the current case definition for laboratory-confirmed infection, we do not have a way to identify them.

4,535 laboratory-confirmed human STEC infections were reported to CDC through LEDS

- The top 7 serogroups were O157 (45.1%), O26 (9.6%), O103 (7.9%), O111 (5.2%), O121 (1.6%), O145 (1.6%), and O45 (1.5%).

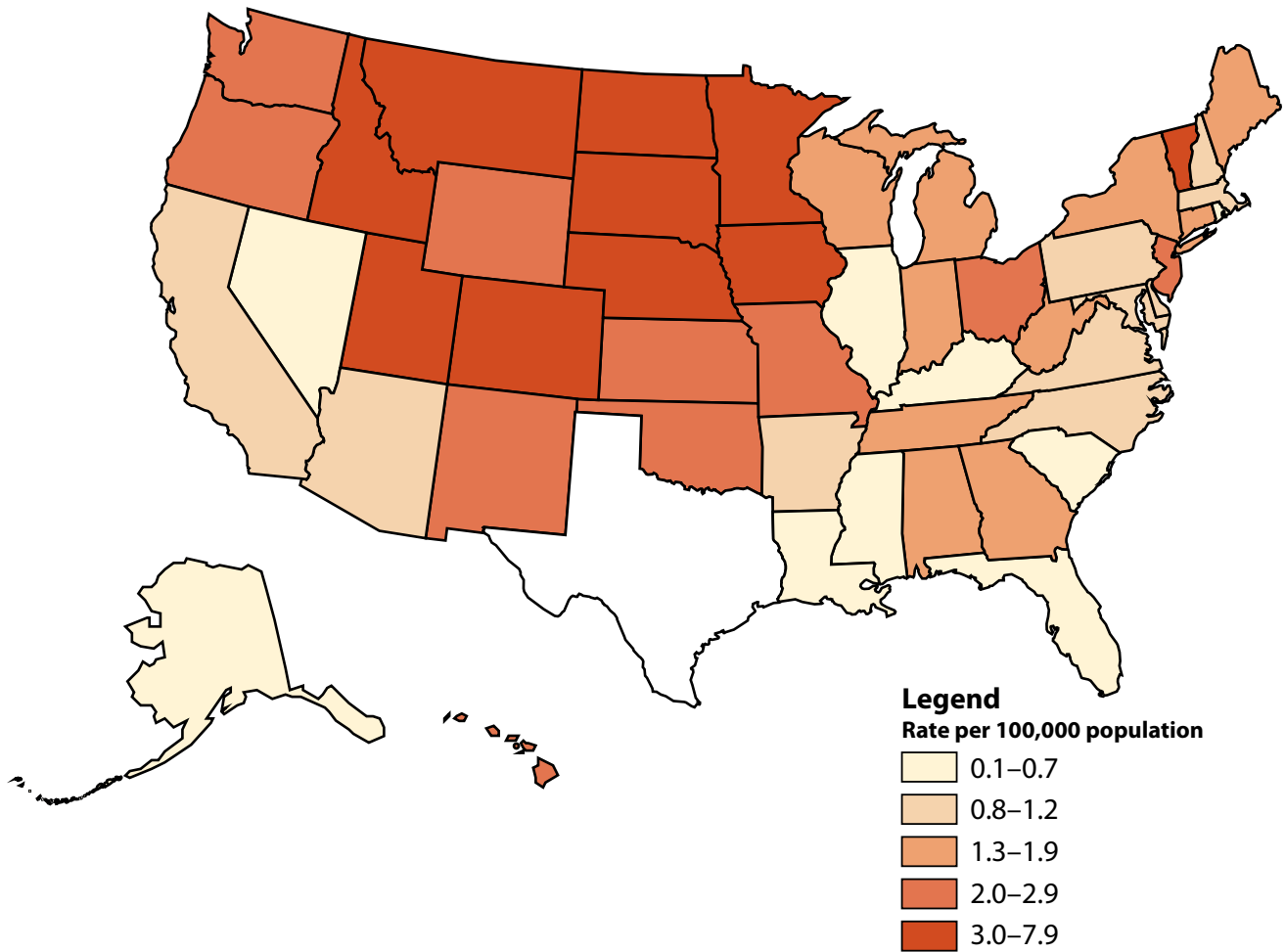
Figure 1. Incidence rate of laboratory-confirmed human STEC infection reported to CDC per 100,000 population, by serogroup and year, United States, 1996–2010 (n=44,413).



The overall incidence rate of STEC infection, 1.5 per 100,000 population, was the highest since surveillance began in 1996

- The incidence rate of reported STEC O157 infection has decreased since 2006. This decrease could reflect a true decrease, the impact of recent changes in diagnostic testing practices, or changes in reporting practices
- The incidence rate of infection with non-O157 STEC and STEC serogroups reported as “unknown serogroup” increased markedly from 2000 to 2010, likely caused by increased testing of diarrheal stools for Shiga toxin in clinical laboratories. It is possible that some of the “unknown serogroup” STEC may represent Shiga toxin-positive stool specimens from which no STEC was isolated that were reported as STEC; although they would not meet the current case definition for laboratory-confirmed infection, we do not have a way to identify them

Figure 2a. Incidence rate of laboratory-confirmed STEC infection reported to CDC, by state, United States, 2010 (n=4,535)*

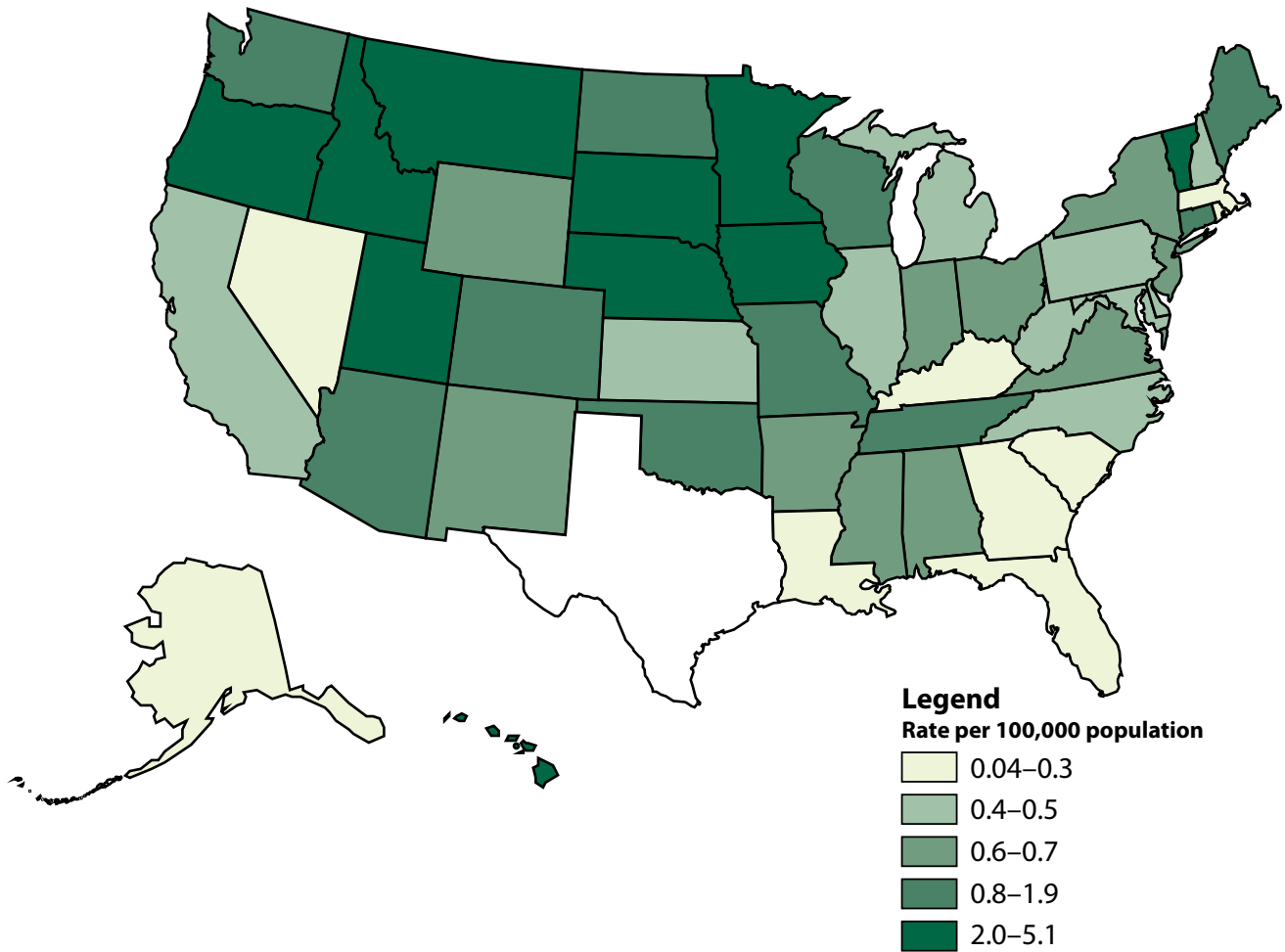


* Unshaded states are those that reported no STEC infections (no infections were diagnosed or the state did not report to CDC).

Almost all states reported infections. The overall incidence rate (cases per 100,000 population) was 1.5

- Incidence rates were generally highest in the northern latitude states. The states with the highest reported incidence rates were Utah (7.9), Iowa (5.8), and Minnesota (5.5)

Figure 2b. Incidence rate of laboratory-confirmed STEC O157 infection reported to CDC, by state, United States, 2010 (n=2,046)*

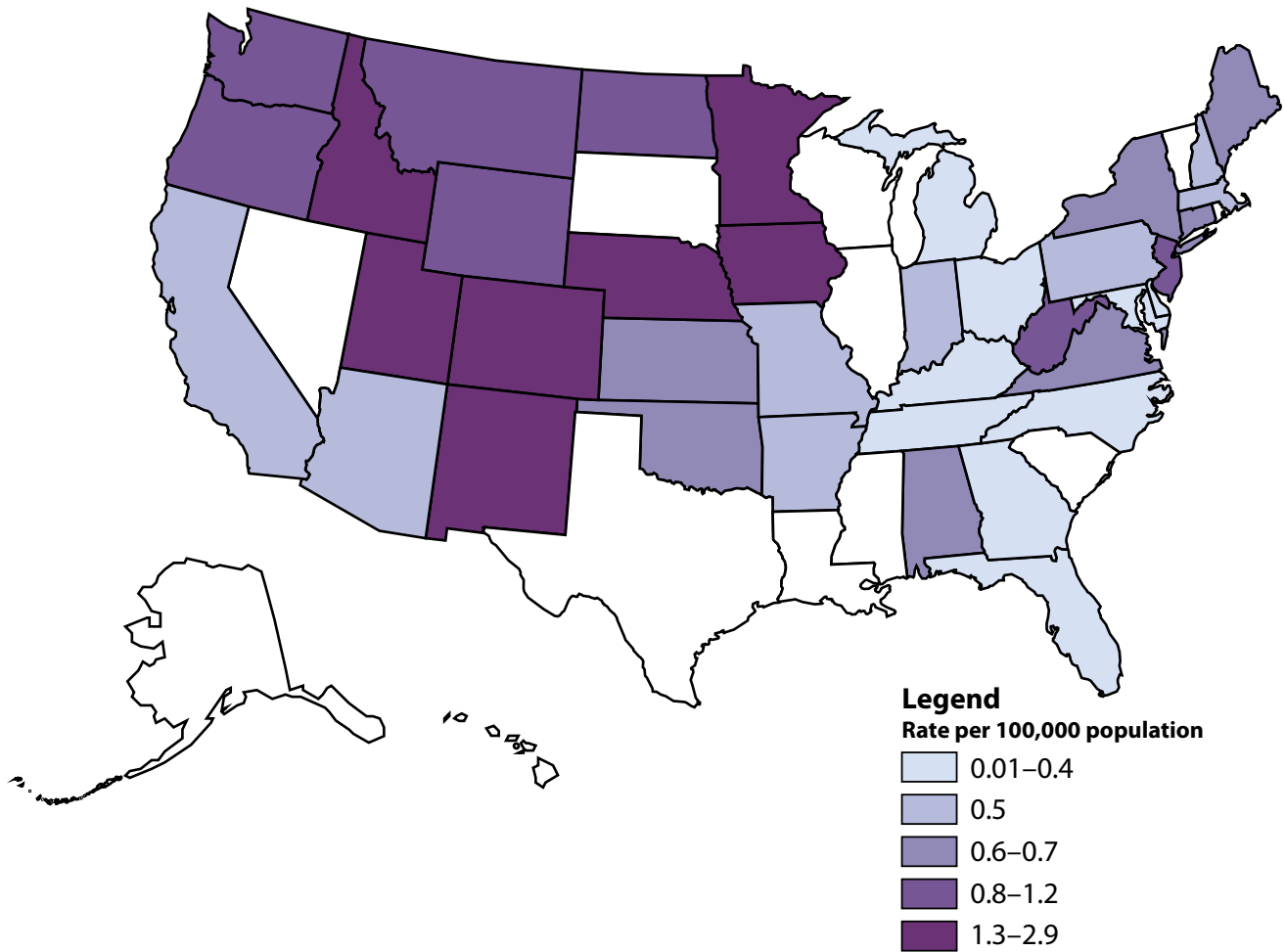


* Unshaded states are those that reported no STEC O157 infections (no infections were diagnosed or the state did not report to CDC).

49 states reported a total of 2,046 laboratory-confirmed STEC O157 infections, corresponding to an incidence rate (cases per 100,000 population) of 0.66

- States in the upper Midwest generally had the highest incidence rate, whereas states in the south generally had the lowest incidence rates. The states with the highest reported incidence rates were South Dakota (5.1), Vermont (3.0), and Utah (2.6)

Figure 2c. Incidence rate of laboratory-confirmed non-O157 STEC infection reported to CDC, by state, United States, 2010 (n=1,408)*



* Unshaded states are those that reported no STEC non-O157 infections (no infections were diagnosed or the state did not report to CDC).

37 states reported a total of 1,408 laboratory-confirmed non-O157 STEC infections, corresponding to an incidence rate (cases per 100,000 population) of 0.46

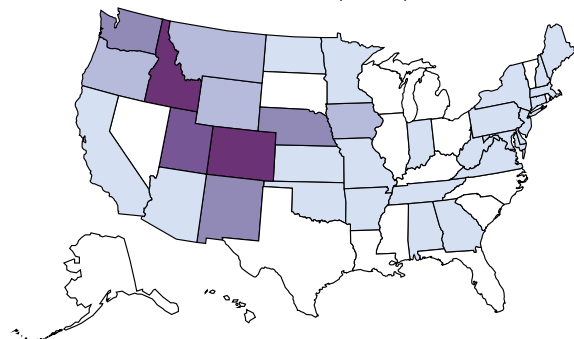
- The states with the highest reported incidence rates of non-O157 STEC infection were Colorado (2.9), Idaho (2.7) and Iowa (2.5)

Figure 2d. Incidence rate of laboratory-confirmed non-O157 STEC infection, top 6 non-O157 STEC serogroups, reported to CDC by state, United States, 2010 (n=1,246)

Legend Rate per 100,000 population

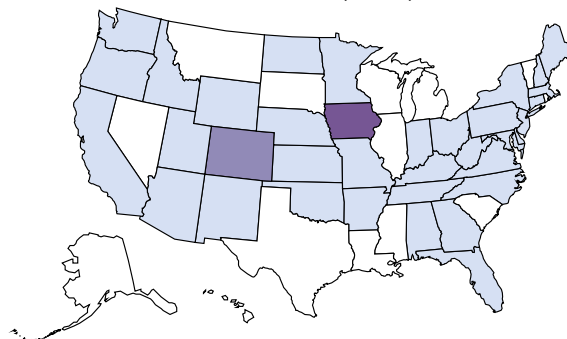
0.01–0.4 0.5 0.6–0.7 0.8–1.2 1.3–2.9 No infections were diagnosed or the state did not report to CDC.

STEC O26 (n=434)



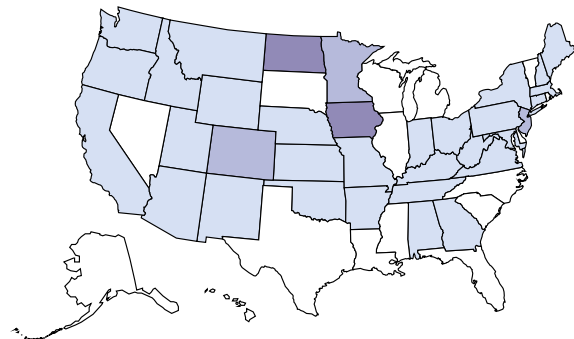
- 34 states reported 434 STEC O26 laboratory-confirmed infections, corresponding to an incidence rate (cases per 100,000 population) of 0.14. The state with the highest incidence rate was Idaho (1.4)

STEC O103 (n=358)



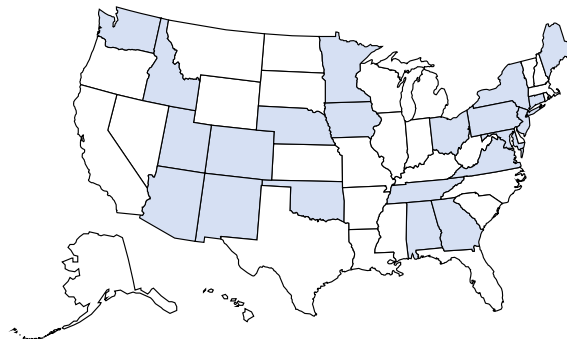
- 36 states reported 358 laboratory-confirmed STEC O103 infections, corresponding to an incidence rate of 0.12. The state with the highest incidence rate of laboratory-confirmed STEC O103 was Iowa (0.98)

STEC O111 (n=236)



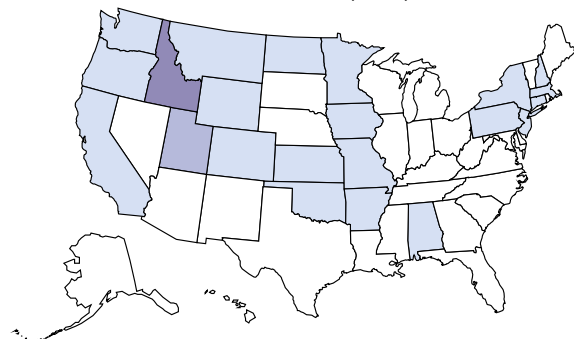
- 33 states reported 236 laboratory-confirmed STEC O111 infections, corresponding to an incidence rate of 0.04. The state with the highest incidence rate of laboratory-confirmed STEC O111 infection was Iowa (0.56)

STEC O145 (n=74)



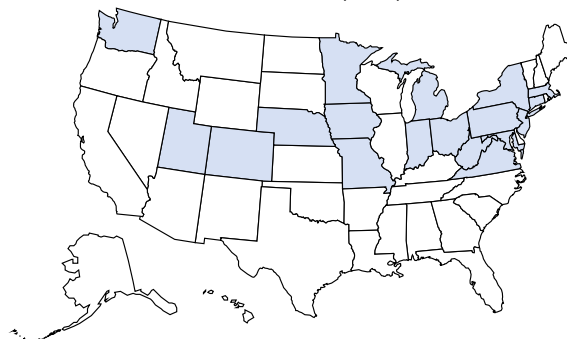
- 22 states reported 74 laboratory-confirmed STEC O145 infections, corresponding to an incidence rate of 0.02

STEC O121 (n=74)



- 22 states reported 74 laboratory-confirmed STEC O121 infections, corresponding to an incidence rate of 0.02

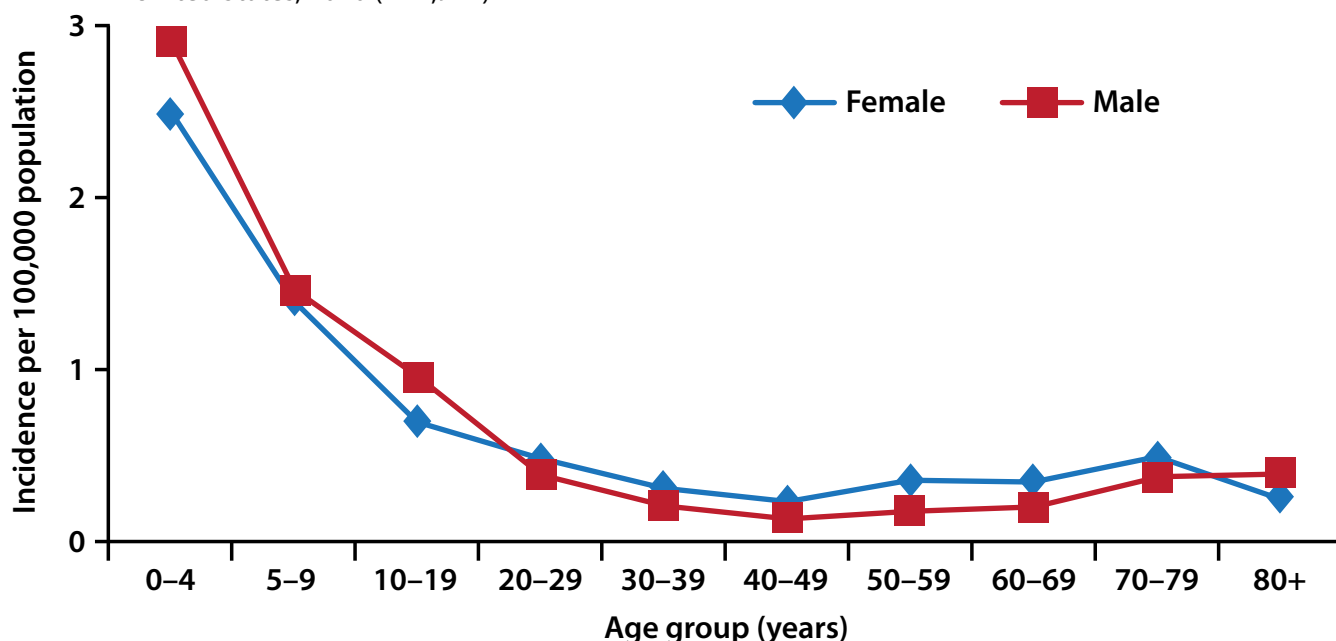
STEC O45 (n=70)



- 18 states reported 70 laboratory-confirmed STEC O45 infections, corresponding to an incidence rate of 0.02

The 6 non-O157 STEC serogroups that caused the most infections during 2010 were O26, O103, O111, O145, O121 and O45. Fewer states reported laboratory-confirmed non-O157 STEC infections to LEDS than reported laboratory-confirmed STEC O157 infections. This reflects substantial state-to-state variation in clinical testing practices and public health reporting practices. See the National STEC Surveillance Overview <http://www.cdc.gov/nceid/dfwed/PDFs/national-stec-surveillance-overview-508c.pdf> for further information.

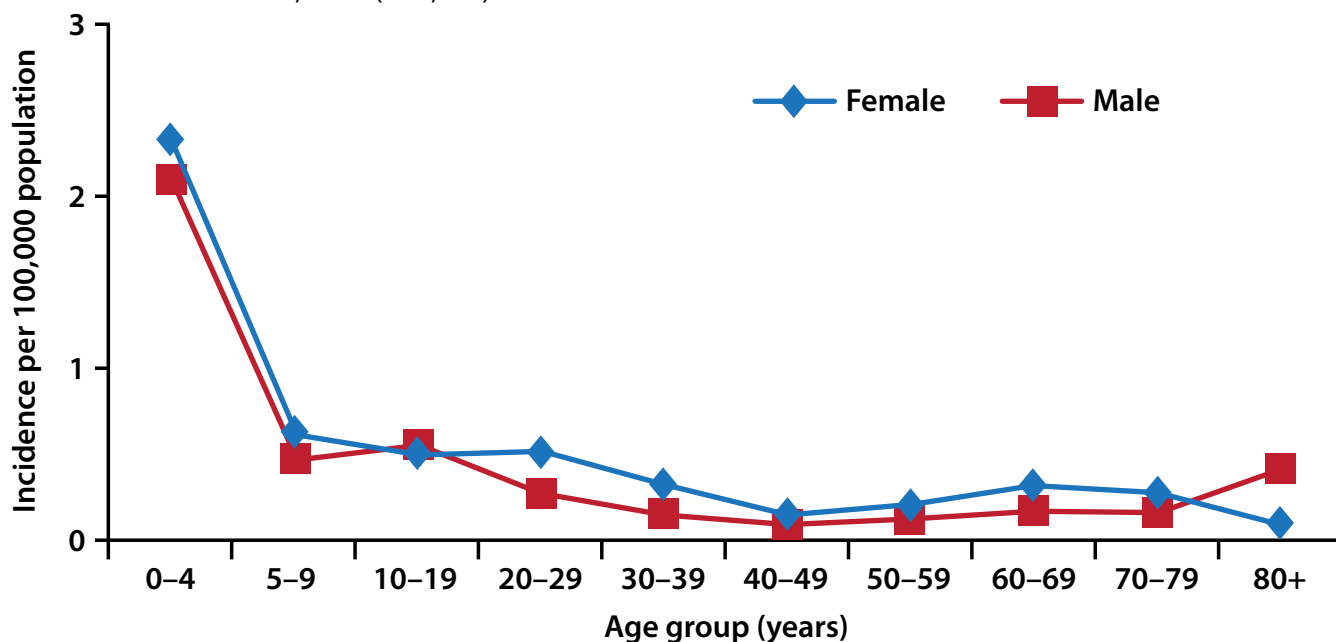
Figure 3a. Incidence rate of laboratory-confirmed STEC O157 infection reported to CDC, by age group and sex, United States, 2010 (n=1,922)



During 2010, the highest incidence rates of STEC O157 infection were in children under 5 years old; this rate was nearly double the incidence rate in children 5 to 9 years old for both males and females

- The incidence rate of STEC O157 infection was slightly higher in males aged 0 to 19 years than females in the same age group but higher in females than males 20 to 79 years old

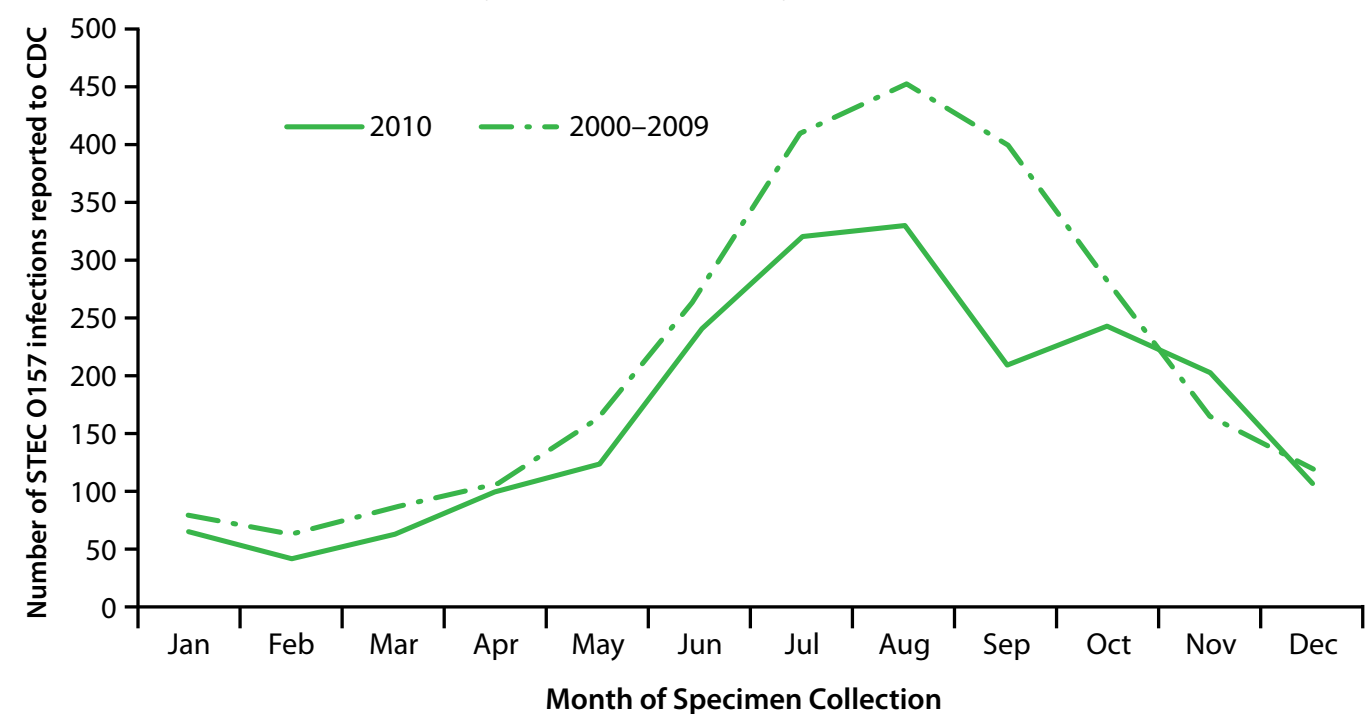
Figure 3b. Incidence rate of laboratory-confirmed non-O157 STEC infection reported to CDC, by age group and sex, United States, 2010 (n=1,309)



During 2010, the highest incidence rates of infection with non-O157 STEC were in children under 5 years old; this rate was nearly 4 times the incidence rate in children 5 to 9 years old

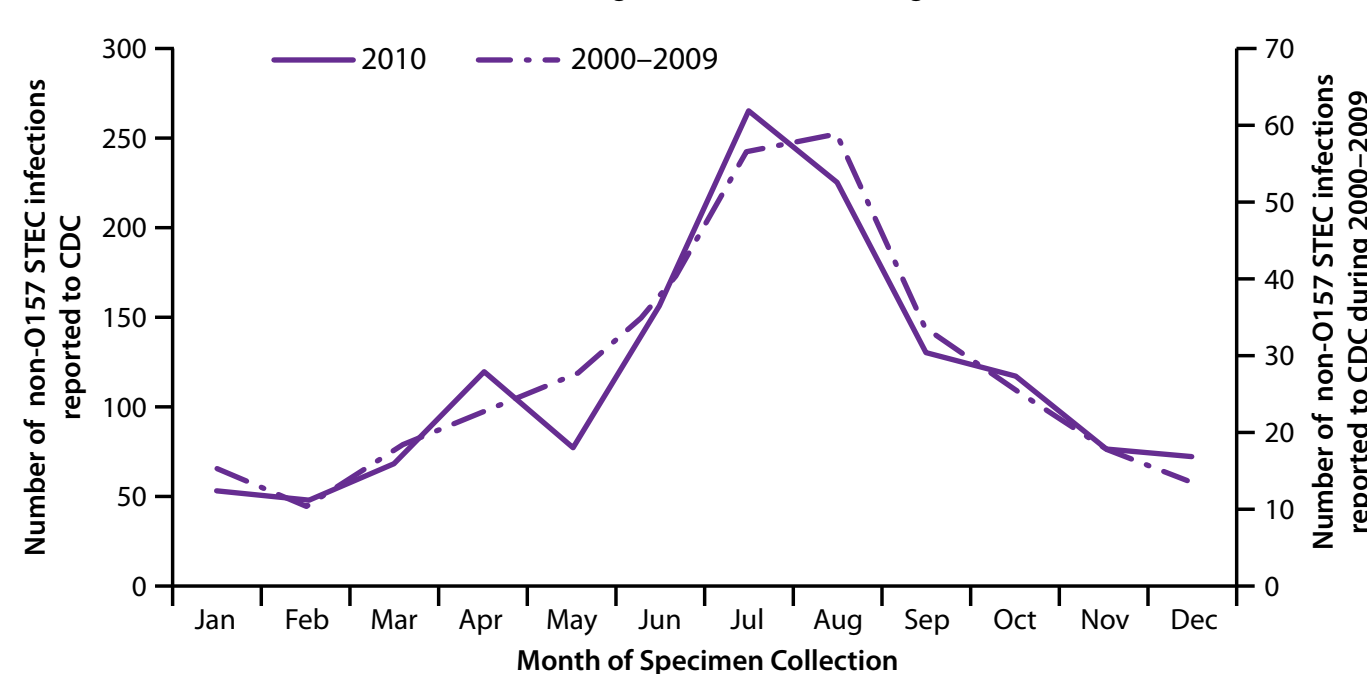
- Incidence rates of non-O157 STEC infection in females were higher than in males in the same age groups, except in males 10 to 19 years old and older than 80 years

Figure 4. Number of laboratory-confirmed STEC O157 infections reported to CDC by month of specimen collection, United States, 2010 and average annual number during 2000–2009



During 2010, laboratory-confirmed STEC O157 infections peaked in the summer and early fall but were below the average annual number during 2000–2009 for every month except November

Figure 5. Number of laboratory-confirmed non-O157 STEC infections reported to CDC by month of specimen collection, United States, 2010 and average annual number during 2000–2009



During 2010, non-O157 STEC infections peaked in the summer and the seasonality was similar to the average annual number during 2000–2009

Human Reference Laboratory Data: National *Escherichia coli* Reference Laboratory Data

The National *Escherichia coli* Reference Laboratory receives unusual or untypable isolates from state public health laboratories for further characterization, including identification and serotyping of non-O157 STEC and identification of Shiga toxins and other virulence factors. It also receives clinical specimens for isolation of STEC. The number of isolates submitted to the National *Escherichia coli* Reference Laboratory is reported with specimen submission rates. The non-O157 STEC specimen submission rate is the number of presumptive non-O157 STEC isolates and Shiga toxin-positive enrichment culture broths submitted to CDC for further characterization for a given year, divided by the population for that year. Submission to the National *Escherichia coli* Reference Laboratory is voluntary, and the number of states submitting isolates varies from year to year.

- Data from the National *Escherichia coli* Reference Laboratory will be included here when available.

Human Surveillance Data: National Notifiable Diseases Surveillance Systems (NNDSS)

The National Notifiable Disease Surveillance System (NNDSS) collects and compiles reports of nationally notifiable infectious diseases, including STEC. This system includes reports of culture-confirmed, probable and suspected cases. The case definition is available at

http://wwwn.cdc.gov/nndss/document/2012_Case%20Definitions.pdf.

The 2010 NNDSS report is available at <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5953a1.htm>.

- A total of 5,476 laboratory-confirmed, probable, and suspect cases of STEC infection were reported to NNDSS during 2010 (2).

Human Antimicrobial Resistance Data: National Antimicrobial Resistance Monitoring System (NARMS)

The National Antimicrobial Resistance Monitoring System (NARMS) monitors antimicrobial resistance among enteric bacteria isolated from humans. NARMS uses the classes of antimicrobial agents defined by the Clinical and Laboratory Standards Institute (CLSI). The 2010 NARMS report on human isolates is available at <http://www.cdc.gov/narms/pdf/2010-annual-report-narms.pdf> (3).

- No resistance was detected among 94.0% (157/167) *E. coli* O157 isolates tested by NARMS.
 - » 6.0% (10/167) were resistant to one or more antimicrobial classes and 3.6% (6/167) were resistant to three or more classes. (NARMS describes multidrug resistance as resistance to three or more antimicrobial classes.)

Human Outbreak Data: Foodborne Disease Outbreak Surveillance System (FDOSS) and Waterborne Disease Outbreak Surveillance System (WBD OSS)

The Foodborne Disease Outbreak Surveillance System (FDOSS) collects reports of foodborne disease outbreaks from local, state, tribal, and territorial public health agencies. Reports can be found at http://www.cdc.gov/outbreaknet/surveillance_data.html.

The Waterborne Disease and Outbreak Surveillance System (WBD OSS) collects reports of disease outbreaks associated with drinking water and recreational water from local, state, tribal, and territorial public health agencies. Reports can be found at <http://www.cdc.gov/healthywater/statistics/wbdoss/surveillance.html>.

References

1. Centers for Disease Control and Prevention (CDC). National STEC Surveillance Overview. Atlanta, Georgia: US Department of Health and Human Services, CDC, 2011.
2. Centers for Disease Control and Prevention (CDC). Summary of notifiable diseases—United States, 2009. MMWR 2011; 58(53): 1-104.
3. Centers for Disease Control and Prevention (CDC). National Antimicrobial Resistance Monitoring System for Enteric Bacteria (NARMS): Human Isolates Final Report, 2010. Atlanta, Georgia: U.S. Department of Health and Human Services, CDC, 2012.

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